What is claimed is:

1.   A method of distributed synchronization for use in a network comprising a plurality of stations communicating over a shared media, said method comprising the steps of:

detecting, on a given station, one or more synchronization signals transmitted by stations directly connected to said given station; and

aligning the phase and rate of an internal clock in said given station in accordance with an earliest received synchronization signal having a time phase earlier to the time phase of said internal clock.

2.   The method according to claim 1, wherein said step of aligning comprises performing a second order tracking loop wherein both the phase and rate of said internal clock are adjusted to the reception time of said earliest received synchronization signal.

3.   The method according to claim 2, wherein said second order tracking loop updates the rate of said internal clock in accordance with $T = T + \beta \cdot t_{correction} + \lambda \cdot (T_{nominal} - T)$.

4.   The method according to claim 1, wherein no one station among said plurality of stations is configured to function as a master station.

5.   The method according to claim 1, wherein said earliest received synchronization signal is received within a time window occurring earlier to the expected time of the next tick of said internal clock.

6.   The method according to claim 5, wherein the length of said time window comprises a predefined fixed time duration.

7.   The method according to claim 5, wherein the length of said time window is programmable and is adapted to be set dynamically.

8.   The method according to claim 1, further comprising the step of ignoring synchronization signals received outside of a time window occurring before the expected time of the next tick of said internal clock.

9.   The method according to claim 1, wherein said step of alignment comprises aligning the phase of said internal clock in accordance with $t(n+1) = t(n) + T + t_{correction}$ where $t(n+1)$ is the time of a reference clock corresponding to tick $n+1$ of said internal clock, T is the

current setting of the period of the internal clock and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

10. The method according to claim 1, wherein said step of alignment comprises aligning the rate of said internal clock in accordance with $T = T + \beta \cdot t_{correction} + \lambda \cdot (T_{nominal} - T)$ where β and λ are factors within the range 0 to less then or equal to 1, $T_{nominal}$ is the nominal period and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

11. The method according to claim 1, further comprising the step of re-aligning both the phase and rate of said internal clock, if after initial alignment is achieved, one or more synchronization signals are received earlier in time than a first time window before the expected time of the next tick of said internal clock.

12. The method according to claim 1, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the same rate.

13. The method according to claim 1, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the rate of a single station in said maximum connected group that effectively functions as an ad hoc master thereof.

14. The method according to claim 1, wherein all stations within a maximum connected group of stations synchronize their respective internal clocks to the station with the fastest internal clock within said maximum connected group.

15. A method of synchronizing a plurality of stations directly connected to each other in a shared communications media based network, said method comprising the steps of:

attempting, on a given station, to detect other stations already active in said network; and if one or more synchronization signals are detected,

updating the phase of an internal clock in said given station in response to an earliest received synchronization signal received before the expected next tick of said internal clock;

updating the rate of said internal clock as a function of the time difference between time phase of said earliest received synchronization signal and the time phase of said given station; and

said given station transmitting synchronization signals upon achieving phase and rate alignment with said earliest received synchronization signal.

16. The method according to claim 15, wherein if no synchronization signals are detected, setting the phase of said internal clock to a random value, rate to a nominal rate and entering an active state wherein said given station begins transmitting synchronization signals.

17. The method according to claim 15, wherein eventually, phase and rate alignment is achieved with a station comprising the fastest internal clock from among said plurality of directly connected stations.

18. The method according to claim 15, wherein said earliest received synchronization signal is received within a time window proportional to the maximum expected propagation delay between two directly connected stations.

19. The method according to claim 15, wherein said step of alignment comprises aligning the phase of said internal clock in accordance with $t(n+1) = t(n) + T + t_{correction}$ where $t(n+1)$ is the time of a reference clock corresponding to tick $n+1$ of said internal clock, T is the current setting of the period of the internal clock and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

20. The method according to claim 15, wherein said step of alignment comprises aligning the rate of said internal clock in accordance with $T = T + \beta \cdot t_{correction} + \lambda \cdot (T_{nominal} - T)$ where β and λ are factors within the range 0 to less then or equal to 1, $T_{nominal}$ is the nominal period and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

21. The method according to claim 15, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the rate of a single station in said maximum connected group that effectively functions as an ad hoc master thereof.

22. The method according to claim 15, wherein all stations within a maximum connected group of stations synchronize their respective internal clocks to the station with the fastest internal clock within said maximum connected group.

23. The method according to claim 15, further comprising the step of re-alignment of both the phase and rate of said internal clock, if after initial alignment is achieved, one or more synchronization signals are received earlier in time than a first time window before the expected time of the next tick of said internal clock.

24. The method according to claim 15, wherein said step of updating the phase of said internal clock is performed for a predetermined time interval.

25. The method according to claim 15, wherein said step of updating the rate of said internal clock is performed for a predetermined time interval.

26. The method according to claim 15, further comprising the step of ignoring synchronization signals received outside of a time window occurring before the expected time of the next tick of said internal clock.

27. An apparatus for synchronizing a plurality of stations directly connected to each other over a shared communications media based network, comprising:

   a detection mechanism adapted to detect synchronization signals transmitted by other stations already active in said network;

   a phase acquisition mechanism adapted to update the phase of an internal clock in a given station in response to an earliest detected synchronization signal received before the expected next tick of said internal clock;

   a rate acquisition mechanism adapted to update the rate of said internal clock as a function of the time difference between time phase of said earliest detected synchronization signal and the time phase of said given station; and

   a transmission mechanism adapted to transmit synchronization signals upon achieving phase and rate alignment with said earliest detected synchronization signal.

28. The apparatus according to claim 27, wherein eventually, phase and rate alignment is achieved with a station comprising the fastest internal clock from among said plurality of directly connected stations.

29.   The apparatus according to claim 27, wherein said earliest received synchronization signal is received within a time window proportional to the maximum expected propagation delay between two directly connected stations.

30.   The apparatus according to claim 27, wherein said phase acquisition mechanism is adapted to align the phase of said internal clock in accordance with $t(n+1) = t(n) + T + t_{correction}$ where $t(n+1)$ is the time of a reference clock corresponding to tick $n+1$ of said internal clock, T is the current setting of the period of the internal clock and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

31.   The apparatus according to claim 27, wherein said rate acquisition mechanism is adapted to align the rate of said internal clock in accordance with $T = T + \beta \cdot t_{correction} + \lambda \cdot (T_{nominal} - T)$ where β and λ are factors within the range 0 to less then or equal to 1, $T_{nominal}$ is the nominal period and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \leq 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

32.   The apparatus according to claim 27, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the frequency of a single station in said maximum connected group that effectively functions as an ad hoc master thereof.

33.   The apparatus according to claim 27, wherein all stations within a maximum connected group of stations synchronize their respective internal clocks to the station with the fastest internal clock within said maximum connected group.

34.   The apparatus according to claim 27, further comprising a re-alignment mechanism adapted to re-align both the phase and rate of said internal clock, if after initial alignment is achieved, one or more synchronization signals are received earlier in time than a first time window before the expected time of the next tick of said internal clock.

35. The apparatus according to claim 27, wherein said phase acquisition mechanism is operative to ignore synchronization signals received outside of a time window occurring before the expected time of the next tick of said internal clock.

36. A communications station for transmitting and receiving signals to and from other directly connected stations over a shared communications media based network, comprising:

a coupling circuit for generating a receive signal received over said network and for outputting a transmit signal onto said network;

a transmitter adapted to modulate data to be transmitted in accordance with a modulation scheme so as to generate said transmit signal therefrom;

a receiver adapted to demodulate said receive signal in accordance with said modulation scheme so as to generate synchronization signals and a receive data signal therefrom;

a media access control (MAC) circuit adapted to interface an application processor to said shared communications media;

a synchronization control circuit comprising means adapted to:

detect one or more synchronization signals transmitted by said other directly connected stations;

align the phase and rate of an internal clock in accordance with an earliest received synchronization signal having a time phase earlier to the time phase of said internal clock; and

said processor adapted to control the operation of said transmitter, receiver and MAC and to provide an interface between said MAC and an external host.

37. The method according to claim 36, wherein said synchronization control circuit is adapted to execute a second order tracking loop wherein both the phase and rate of said internal clock are adjusted to the reception time of said earliest received synchronization signal.

38. The communications station according to claim 36, wherein said earliest received synchronization signal is received within a time window occurring earlier to the expected time of the next tick of said internal clock.

39. The communications station according to claim 36, wherein said synchronization control circuit further comprises means adapted to ignore synchronization signals received

outside of a time window occurring before the expected time of the next tick of said internal clock.

40.   The communications station according to claim 36, wherein said synchronization control circuit is adapted to align the phase of said internal clock in accordance with $t(n+1) = t(n) + T + t_{correction}$ where $t(n+1)$ is the time of a reference clock corresponding to tick $n+1$ of said internal clock, T is the current setting of the period of the internal clock and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \le 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

41.   The communications station according to claim 36, wherein said synchronization control circuit is adapted to align the rate of said internal clock in accordance with $T = T + \beta \cdot t_{correction} + \lambda \cdot (T_{nominal} - T)$ where β and λ are factors within the range 0 to less then or equal to 1, $T_{nominal}$ is the nominal period and $t_{correction}$ is the phase correction value given by $t_{correction} = \alpha \cdot [t_{received} - t(n)]$ where α is a parameter set within the range $0 < \alpha \le 1$ and $t_{received}$ is the time of the earliest of the synchronization signals received.

42.   The communications station according to claim 36, wherein said synchronization control circuit further comprises means for re-aligning both the phase and rate of said internal clock, if after initial alignment is achieved, one or more synchronization signals are received earlier in time than a first time window before the expected time of the next tick of said internal clock.

43.   The communications station according to claim 36, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the same rate.

44.   The communications station according to claim 36, wherein eventually all stations within a maximum connected group of stations adjust their internal clocks to the frequency of a single station in said maximum connected group that effectively functions as an ad hoc master thereof.

45.   The communications station according to claim 36, wherein all stations within a maximum connected group of stations synchronize their respective internal clocks to the station with the fastest internal clock within said maximum connected group.